



Christ Church
Grammar School

2021
Test 2

MATHEMATICS METHODS Year 11

Section One: Calculator-free

Your name Solutions.

Teacher's name _____

Time and marks available for this section

Working time for this section: 30 minutes
Marks available: 30 marks

Materials required/recommended for this section

To be provided by the supervisor

This Question/Answer Booklet
Formula sheet

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: nil

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Instructions to candidates

1. The rules of conduct of the CCGS assessments are detailed in the Reporting and Assessment Policy. Sitting this assessment implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer Booklet using a blue/black pen. Do not use erasable or gel pens.
3. Answer all questions.
4. You must be careful to confine your response to the specific question asked and to follow any instructions that are specified to a particular question.
5. Supplementary pages for the use of planning/continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.
6. **Show all your working clearly.** Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than one mark, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.
7. It is recommended that **you do not use pencil**, except in diagrams.

Question 1

(8 marks)

Solve the following equations.

(a) $8x^2 = 16x$

(2 marks)

$$8x^2 - 16x = 0$$

$$8x(x-2) = 0$$

$$x = 0 \text{ \& } x = 2$$

✓ rearrange to $= 0$

✓ x values
(must include both)

- Allow 2 marks if no working shown

(b) $\frac{2(2-3x)}{5} + \frac{2x-1}{3} + 1 = 2$

(3 marks)

$$\frac{4-6x}{5} + \frac{2x-1}{3} = 1$$

$$\frac{3(4-6x) + 5(2x-1)}{15} = 1$$

$$12 - 18x + 10x - 5 = 15$$

$$7 - 8x = 15$$

$$-8x = 8$$

$$x = -1$$

✓ Common denominator or multiplies by LCM

✓ Simplified

✓ Obtains x value

(c) $\frac{16}{x} = x + 6$

(3 marks)

$$16 = x^2 + 6x$$

$$0 = x^2 + 6x - 16$$

$$0 = (x+8)(x-2)$$

$$x = -8 \text{ \& } x = 2$$

✓ rearrange or states $= 0$

✓ factorise

✓ x values

Question 2

(5 marks)

Given that $f(x) = 6 - 5x$ and $g(x) = 6x^2 + 7x$, find:

(a) $f(-1) + g(-1)$

(2 marks)

$$6 - 5(-1) + 6(-1)^2 + 7(-1) \\ = 10$$

✓ Substitutes $x = -1$

✓ Simplifies

* If they just show 10, must award 2 marks.

(b) x , when $g(x) = 10$

(3 marks)

$$10 = 6x^2 + 7x \\ 0 = 6x^2 + 7x - 10 \\ 0 = (6x - 5)(x + 2) \\ x = \frac{5}{6} \quad \& -2$$

✓ rearranges to $= 0$

✓ factorises

✓ solves for x

Question 3

(5 marks)

- (a) For what value/s of a is the point $(a, 3)$ 13 units away from the point $(7, 8)$.

(3 marks)

$$\left. \begin{aligned} 13 &= \sqrt{(8-3)^2 + (7-a)^2} \\ 169 &= (5)^2 + (7-a)^2 \\ 144 &= (7-a)^2 \end{aligned} \right\}$$

$$\pm 12 = 7 - a$$

$$a = 19$$

$$a = -5$$

✓ Uses distance formula correctly

✓ Rearrange or solves for a .

✓ a values, must have both

- (b) The point $M(8, 1)$ is the midpoint of A and $B(20, 7)$. Determine the coordinates of A .

(2 marks)

$$(8, 1) = \left(\frac{x+20}{2}, \frac{7+y}{2} \right)$$

$$8 = \frac{x+20}{2}$$

$$x = -4$$

$$1 = \frac{7+y}{2}$$

$$y = -5$$

$$\therefore (-4, -5) \quad \checkmark \text{Coordinate}$$

(must give 2 marks if correct coordinate but no working)

-1 if not given as a coordinate.

Question 4

(9 marks)

- (a) A straight line passes through points $C(2, -5)$ and $D(-2, 2)$. Determine the equation of the straight line that is perpendicular to this line and passes through C , expressing your answer in the form $ax + by + c = 0$, where a , b , and c are integers. (4 marks)

$$m = \frac{-5 - 2}{2 - (-2)}$$

$$= \frac{-7}{4}$$

$$y = \frac{4}{7}x + c \quad \text{sub in } (2, -5)$$

$$-5 = \frac{4}{7}(2) + c$$

$$-5 = \frac{8}{7} + c$$

$$c = -5 - \frac{8}{7} = -\frac{43}{7}$$

$$\therefore y = \frac{4}{7}x - \frac{43}{7}$$

$$7y = 4x - 43$$

$$7y - 4x + 43 = 0$$

✓ Calculates gradient of CD

✓ Finds perpendicular gradient

✓ Calculates c value.

✓ final equation in $ax + by + c = 0$ form.

Question 4 continued

(b) For the graph with the equation $y = (x + 2)(x - 4)$, determine the coordinates of

(i) all intercepts.

(3 marks)

$$\begin{aligned} x \text{ intercepts: } & (-2, 0) \text{ \& } (4, 0) \quad \checkmark\checkmark \\ y \text{ int: } & (0, -8) \quad \checkmark \end{aligned}$$

One mark
for each

- 1 if not
coordinates.

(ii) the turning point.

(2 marks)

$$\begin{aligned} \frac{4-2}{2} &= 1 \\ y &= (1+2)(1-4) \\ &= -9 \\ \therefore &(1, -9) \end{aligned}$$

✓ finds line
of symmetry

✓ Correct
coordinate

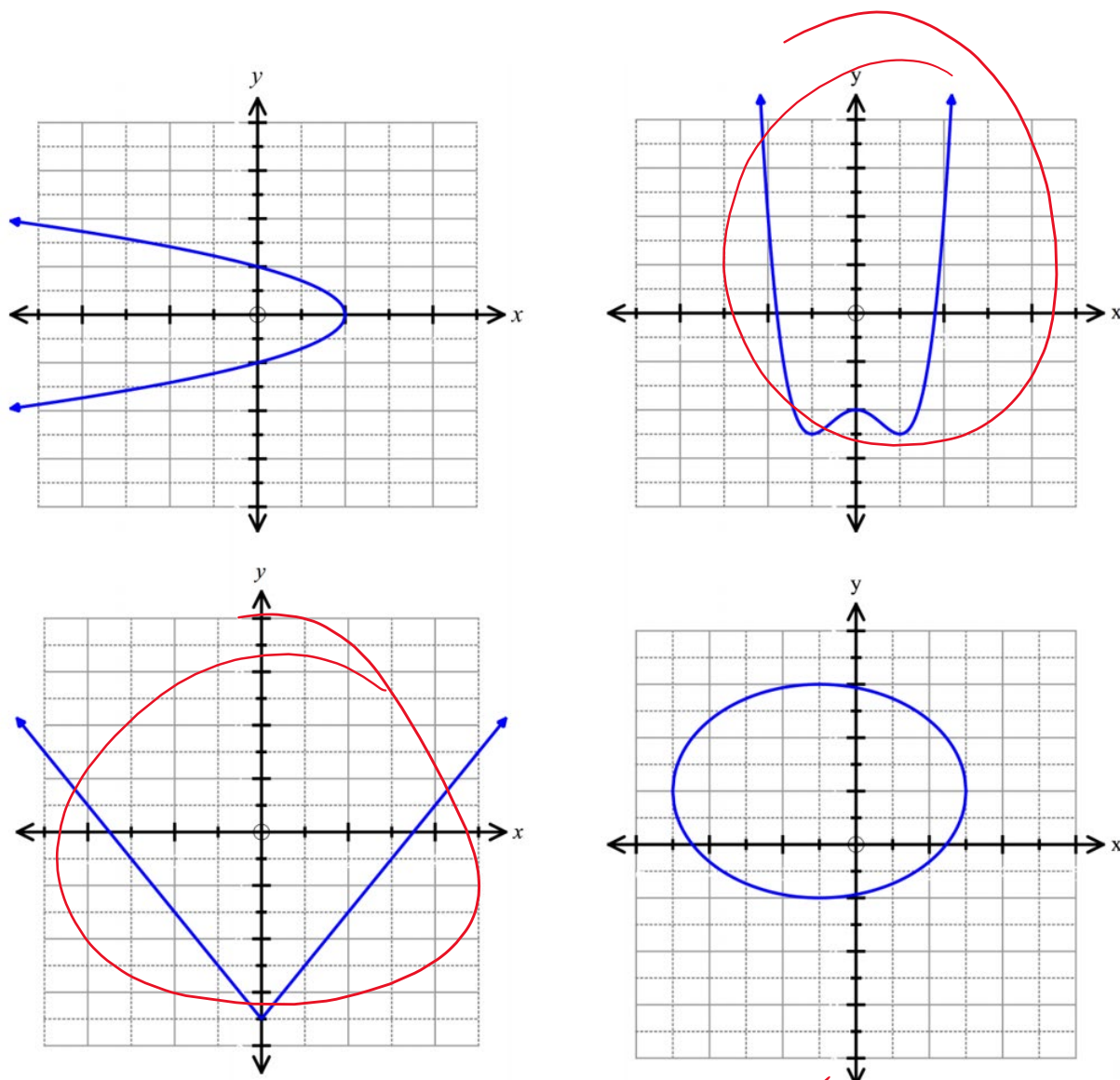
(must award 2
marks if correct
coord but no
working)

Question 5

(3 marks)

(a) Circle the graph/s that represent a function.

(2 marks)



✓✓ 1 mark for each

(b) Explain why the graph/s selected in part (a) represent a function.

(1 mark)

each graph passes the vertical line test.

✓ mentions vertical line test, one to one or many to one.

End of questions



MATHEMATICS METHODS Year 11

Section Two:

Calculator-assumed

Your name Solutions

Teacher's name _____

Time and marks available for this section

Working time for this section: 15 minutes

Marks available: 14 marks

Materials required/recommended for this section

To be provided by the supervisor

This Question/Answer Booklet

Formula Sheet (retained from Section One)

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: drawing instruments, templates, and up to three calculators approved for use in the WACE examinations

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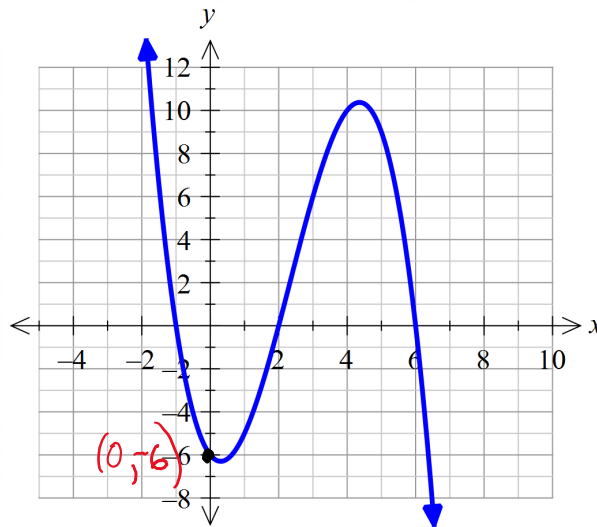
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Question 6

(6 marks)

The graph of $y = ax^3 + bx^2 + cx + d$ is shown below. Determine the values of the constants a , b , c , and d .



$$y = a(x+1)(x-2)(x-6)$$

$$-6 = a(0+1)(0-2)(0-6)$$

$$a = -\frac{1}{2}$$

$$y = -0.5x^3 + 3.5x^2 - 2x - 6$$

$$a = -\frac{1}{2} \quad b = 3.5$$

$$c = -2 \quad d = -6$$

✓ Uses x intercepts to write factors

✓ Uses a coordinate to find a

✓✓✓ a, b, c and d

(-1 mark if not given as $a = , b = , c = \text{ and } d =$)
(3 marks)

Question 7

State the natural domain and range for the function $y = 5 - x^2$

$$\text{Domain: } \{x \in \mathbb{R}\} \quad \checkmark$$

$$\text{Range: } \{y \in \mathbb{R} : y \leq 5\} \quad \checkmark$$

Correct domain

Correct range

✓ Correct notation

Question 8

(5 marks)

The water level under the Narrows Bridge approximately follows the formula

$h = \frac{20t - 2t^2}{5}$ where h is the vertical height of water (in metres) and t is the number of hours after 9 am.

- (a) At what time is the water level at its highest?

(1 mark)

When $t = 5$

$\therefore 2.00\text{pm}$

✓

time correct

- (b) Determine the height of the water level at this time.

(1 mark)

10m

✓ correct height.

- (c) If the Rottnest Ferries can only pass under the bridge when the water level is 2.5 metres or more below the maximum height. Determine during which times of the day a ferry can pass under the bridge.

(3 marks)

$(2.5, 7.5)$ and $(7.5, 7.5)$

✓ finds t when
 $h = 7.5$

Before 11.30am and after 4.30pm

✓✓ correct
time.